

CLAIMS

1. A radiopharmaceutical generation system comprising:
a fluid processing system arranged to perform one or more processes in
5 relation to a radiopharmaceutical, the fluid processing system having a plurality
of system elements and being arranged to output signals indicative of a state of
the fluid processing system, each of said system elements having an expected
operative state; and
at least one monitoring software component arranged to derive data from
10 said output signals and to compare said derived data with one or more operating
conditions in order to identify system elements not in the expected operative
state.
2. A system according to claim 1, wherein the or each system
15 element is arranged to receive one or more control signals, the system including
a controller arranged to generate said control signals, wherein said one or more
processes are performed in accordance with said control signals.
3. A system according to claim 2, wherein the controller is arranged
20 to receive said output signals indicative of state of the radiopharmaceutical
generation system.
4. A system according to claim 3, wherein the controller is arranged
to track the state of the radiopharmaceutical generation system on the basis of
25 said received output signals, and transmit data indicative of a state of the fluid
processing system to the monitoring software component in response to a
change in the state of the radiopharmaceutical generation system.
5. A system according to claim any one of claim 2 to claim 4,
30 wherein the signals indicative of a state of the fluid processing system
correspond to transmission of control signals to at least one system element.

6. A system according to any one of the preceding claims, wherein the monitoring software component is arranged to trigger a termination control signal in response to the derived data satisfying a specified condition, the
5 termination control signal, when received by a system element, causing a currently executing process to terminate.

7. A system according to any one of the preceding claims, wherein the monitoring software component is arranged to trigger a termination control
10 signal to each of said system elements identified as not being in the expected operative state, the termination control signal, when received by said system element, causing a currently executing process to terminate.

8. A system according to any one of the preceding claims, including
15 alerting means arranged to generate an alert in response to the monitoring software component identifying that one of said system elements is not in the expected operative state.

9. A system according to any one of the preceding claims, wherein
20 the monitoring software component is arranged to process said data derived from said output signals in order to identify a state of the fluid processing system.

10. A system according to claim 9, including an outputting software
25 component arranged to output data indicative of the identified state.

11. A system according to claim 10, wherein the outputting software component includes display means arranged to display the data indicative of the
30 identified state.

12. A system according to claim 11, wherein the display means is arranged to display a natural language descriptor corresponding to said identified state.

5 13. A system according to any one of the preceding claims, wherein the fluid processing system includes: a heating device; a radiopharmaceutical delivery system comprising an output to a subject; a plurality of valves arranged to control the path of the delivery system; a dialyser; a pump for pumping the radiopharmaceutical around the delivery system; and at least one radioactivity
10 detector arranged in the path of the radiopharmaceutical delivery path.

14. A system according to claim 13, wherein the fluid processing system is operable to output signals indicative of at least some of: temperature of heating device; energised status of the valves; flow rate through, and pressure
15 applied by, the pump; radioactivity measured by radioactivity detector; and time elapsed since the process started.

15. A system according to claim 14, wherein the monitoring software component is arranged to identify which of the processes is currently being
20 performed on the basis of data identifying the energised status of the valves.

16. A system according to any one of claim 13 to claim 15, wherein the monitoring software is arranged to compare data derived in respect of the pump pressure and data derived in respect of the flow rate with specified
25 operating limits, and, in the event that one or both of the pressure and/or flow rate fall outside of the operating limits, to generate an alert.

17. A system according to any one of the preceding claims, wherein the radiopharmaceutical comprises ¹⁵O-labelled water.

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18. A computer program product arranged to perform at least some of the steps of:

generating a plurality of control signals for use in control of a fluid processing system;

5 transmitting said generated control signals to a plurality of system elements in the fluid processing system;

communicating data indicative of at least some of said generated control signals to a monitoring system;

10 processing the communicated data so as to identify expected operating states of said system elements;

receiving data indicative of operating states of said system elements;

15 comparing the received data against one or more predetermined conditions based on the expected operating states, and, in response to the received data indicating that one or more of the system elements is not in the expected state, transmitting data indicative thereof to the monitoring system.

19. A computer program product arranged to perform at least some of the steps of:

20 transmitting specified operating conditions to a controller for use in formulating control signals for controlling a fluid processing system;

receiving data indicative of a state of the fluid processing system;

evaluating said received data in accordance with specified conditions;

and

25 generating user-perceptible output indicative of the evaluated data.

20. A radiopharmaceutical generation system comprising:

30 a fluid processing system arranged to perform one or more processes in relation to a radiopharmaceutical, the fluid processing system having at least one actuator element capable of adopting a plurality of operating positions, the fluid processing system being arranged to determine a current operating position of

the actuator element and to output a signal indicative of the determined operating position; and

at least one monitoring software component arranged to process data derived from said output signal during execution of said one or more processes
5 in order to identify a state of the fluid processing system.

21. A system according to claim 20, wherein said actuator elements include valve elements.

10 22. A radiopharmaceutical generation system comprising:
a fluid processing system arranged to perform one or more processes in relation to a radiopharmaceutical in accordance with a plurality of control signals, the fluid processing system having a plurality of system elements and being arranged to output signals indicative of a state of the fluid processing
15 system, each of said system elements having an expected operative state;
a controller arranged to control the fluid processing system, the controller having at least one control software component arranged to generate at least some of said control signals;
a monitoring software component arranged to receive data in relation to
20 the state of the radiopharmaceutical generation system,
wherein the controller is arranged to track the state of the radiopharmaceutical generation system during execution of said one or more processes and output data indicative of the same to the monitoring software component, the monitoring software component being arranged to compare said
25 output data with one or more operating conditions in order to identify system elements not in the expected operative state.

23. A radioactivity detection system for use in relation to a radiopharmaceutical, the detection system comprising:
30 a fluid processing module arranged to receive a radioisotope and to generate a radiopharmaceutical therefrom;

a radiopharmaceutical delivery system arranged to deliver the generated radiopharmaceutical to a subject, the radiopharmaceutical delivery system comprising a delivery path operable between said fluid processing module and said subject; and

- 5 a radioactivity detector arranged to measure radioactivity in the delivery path and output a signal indicative thereof.

24. A radioactivity detection system according to claim 23, wherein the radioactivity detector is located along the delivery path at a distance of
10 between 5% and 50% of the delivery path length from the subject, more preferably at a distance of between 7% and 12% of the delivery path length from the subject.

25. A radioactivity detection system according to claim 23 or claim
15 24, wherein the radioactivity detection system includes a processing system arranged to process said output signal.

26. A radioactivity detection system according to any one of claims
20 23 to 25, wherein the fluid processing module includes a module radioactivity detector therein, said module radioactivity detector being arranged to measure radioactivity in the fluid processing module and output a signal indicative thereof, wherein the processing system is arranged to process said output signal.

27. A radioactivity detection system according to claim 26, wherein
25 the processing system is arranged to compare signals received from the radioactivity detector and said module radioactivity detector.

28. A radioactivity detection system according to claim 27, wherein
an output signal comprises a plurality of signal components, and, for at least one
30 such signal component received from the module radioactivity detector, the

processing system is arranged to identify a corresponding component in the signal received from the radioactivity detector.

29. A radioactivity detection system according to claim 27 or claim 28, wherein, for at least one such signal component received from the module radioactivity detector, the processing system is arranged to identify the temporal delay between detection thereof and detection of a corresponding component in the signal received from the radioactivity detector.

30. A radioactivity detection system according to any one of claim 26 to claim 29, wherein the processing system is arranged to receive data indicative of distance between the radioactivity detector and said module radioactivity detector.

31. A radioactivity detection system according to claim 30 when dependent on any one of claim 27 to claim 29, wherein, for any signal component of the signal received from the radioactivity detector, the processing system is arranged to estimate an expected delay in occurrence thereof in relation to a corresponding component of the signal received from the module radioactivity detector, based on the distance data, and to compare the identified temporal delay corresponding to the signal component with the estimated delay.

32. A radioactivity detection system according to claim 30 or claim 31 when claim 30 is dependent on any one of claim 27 to claim 29, wherein, for any signal component of the signal received from the module radioactivity detector, the processing system is arranged to estimate an expected radioactivity value, based on the half-life of the radioisotope and the distance data, and to compare the signal component with the estimated radioactivity value.

33. A radioactivity detection system according to any one of claim 23 to claim 32, wherein the fluid processing module includes: a heating device;

a plurality of valves arranged to control the path of the delivery system; a dialyser; and a pump for pumping the radiopharmaceutical around the delivery system.

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